

Reg No.: _____

Name: _____



APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

B.Tech Degree S7 (S, FE) (FT/WP/S5PT) Examinations May 2026 (2019 Scheme)

Course Code: MET445

Course Name: RENEWABLE ENERGY ENGINEERING

Max. Marks: 100

Duration: 3 Hours

PART A

Answer all questions, each carries 3 marks.

Marks

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| 1 | Risks associated with energy produced from nuclear power are less than from coal-burning plants. Justify this statement. | (3) |
| 2 | Explain: (i) Solar insolation (ii) Concentration ratio (iii) Irradiation | (3) |
| 3 | Compare a flat plate collector (FPC) with an Evacuated tube collector (ETC). | (3) |
| 4 | Describe the principle of solar air heaters with a sketch? | (3) |
| 5 | Explain the effect of Angle of attack in wind turbine blades. | (3) |
| 6 | With the help of a model diagram describe the significance of Windrose Diagram? | (3) |
| 7 | Describe the principle of Ocean Thermal Energy Conversion (OTEC) system. | (3) |
| 8 | What is geothermal energy and how variations in geothermal gradient influences the availability for geothermal energy? | (3) |
| 9 | Discuss the various factors affecting the performance of a biomass digester. | (3) |
| 10 | Explain the various methods used for storage of hydrogen for energy. | (3) |

PART B

Answer any one full question from each module, each carries 14 marks.

Module I

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|----|---|-----|
| 11 | a) Explain why solar power is an excellent alternative energy resource suitable for rural and agricultural sectors in India? | (6) |
| | b) Determine the Solar Zenith and Azimuth angles at 15:00 (03:00 PM) solar time in a city with angle of Latitude 33.5 degree on 21 st June 2025. | (8) |

OR

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|----|--|-----|
| 12 | a) With a neat sketch, explain the working of Pyrheliometer. | (6) |
| | b) Explain the Basic Sun-Earth Angles with neat sketches. | (8) |

Module II

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|----|--|-----|
| 13 | a) Describe the construction and working of evacuated tube collectors. | (6) |
| | b) Explain the working of a solar absorption refrigeration system with sketches. | (8) |

OR

- 14 a) A Solar cell (0.9cm^2) receives solar radiation with photons of 1.8 eV energy having an intensity of 0.9 mW/cm^2 . Measurements show open circuit voltage of 0.6 V/cm^2 , short circuit current of 10 mA/cm^2 , and the maximum current is 50% of the short circuit. If the efficiency of cell is 25%. Calculate the maximum voltage that the cell can give and find the fill factor. (6)
- b) Explain the basic components of photovoltaic system for power generation with schematic diagram? (8)

Module III

- 15 a) Explain the principle of wind energy conversion in aerofoil with a neat sketch. (6)
- b) Explain construction and working of wind turbine with suitable sketches (8)

OR

- 16 a) Differentiate between Vertical axis and Horizontal axis wind turbines. (6)
- b) Explain the significance of Solidity, Tip-speed ratio (TSR), Cut-in speed and Cut-out speed of a wind turbine. (8)

Module IV

- 17 a) Explain with neat sketch the vapour dominated geothermal system. (6)
- b) With a neat sketch explain the working of Claude cycle OTEC system. (8)

OR

- 18 a) Explain the working of liquid dominated flashed steam hydrothermal system with a neat sketch. (6)
- b) Explain any two types of wave energy devices to harness energy from ocean. (8)

Module V

- 19 a) Explain the differences in method of production of bioethanol and biodiesel. (6)
- b) With the help of a sketch, discuss the construction and working of a fixed-dome type (Janata model) biogas plant. (8)

OR

- 20 a) Differentiate between simple payback period and discounted payback period. (6)
- b) The initial cost of a solar energy system is \$ 12,500. If this amount is paid with a 20 % down payment and the balance is borrowed at a 9% interest for 10 years, calculate the annual payments and interest charges for a market discount rate of 7%. Also estimate the present worth of the annual payments. (8)
